Practical Applications of the METRIC Evapotranspiration Model

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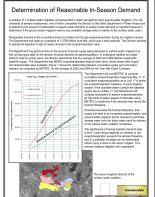
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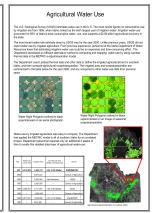1 present affiliation: Spatial analysis Group, PO Box 2761, Boise, ID 83701

Negotiations – Tribal Water Rights

Water Right Compliance

Determination of Reasonable In-Season Demand

Endangered Species

Agricultural Water Use

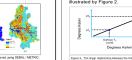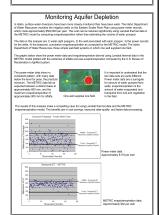## Administering Water Rights

Negotiations – Legal Finding of Fact

Nineteenth-century observers from John Wesley Powell to Mark Twain warned that water in the west is a limited and tenuous resource. Those observations are even more compelling at the beginning of the 21st century. The pressures on western water are increasing with a changing climate, an increasing population, and a growing body of environmental regulation. Water-resource agencies in western states are attempting to meet these pressures with new tools, one of which is an energy-balance evapotranspiration model, METRIC. The METRIC model uses data from weather stations and Landsat to compute and map evapotranspiration in great detail over large spatial extents. Eleven western states have developed applications based on evapotranspiration data put out by METRIC. In Idaho, these applications include 1) developing water budgets for hydrologic modeling, 2) assessment of injury in administering agricultural water-rights, 3) irrigation needs assessment for endangered species protection, 4) analysis of ET by land-use/land-cover type for planning, 5) water-rights negotiations, and 6) monitoring agricultural pumpage. METRIC results have been used in legal proceedings and are now part of adjudicated decisions. Perhaps the most important feature of using METRIC with Landsat data is that evapotranspiration is computed for each of Landsat's 900 square-meter pixels, which enables evapotranspiration to be aggregated up to the level of individual fields where western water and water rights are actually managed.

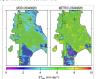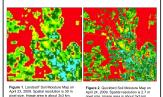## Initializing Distributed Hydrologic Models

How METRIC Works

General Principle

METRIC (Mapping EvapoTranspiration at high Resolution with Internalized Calibration) is an image-processing tool for computing evapotranspiration (ET) as a residual of the energy balance at the surface using the equation $ET = R_n - G - H$ where ET is evapotranspiration, R_n is net radiation, G is sensible heat flux conducted into the ground, and H is sensible heat flux convected into the air, as illustrated by Figure 1. The fundamental principle underlying METRIC is that evaporating liquids absorb heat. (Allen, et al., 2007).

Introduction

Internal Calibration

24-Hour ET

Monthly and Seasonal ET

Accuracy

References

Monitoring Aquifer Depletion

Using METRIC to Calibrate Smaller-Scale Evapotranspiration Models

North Platte Water Decree

Mapping Soil Moisture at High Resolution for IED Detection

Compliance Assessment

Water Rights Buy-Back